



*Pediatric
Dentistry*



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Contents

General Information in Pediatric Dentistry.....	3
Fluoride.....	3
Public Health Dentistry.....	4
Restorative Materials.....	5
New Trends in Pediatric Dentistry.....	6
Oral Pathology.....	6
Special Needs Children.....	6
Child Abuse and Neglect.....	8
Age-Specific Information:	
Birth to Three Years, Three to Six Years, Six to 12 Years, and Adolescence.....	8
<i>Birth to Three Years.....</i>	<i>8</i>
Growth and Development.....	8
Examination.....	9
Fluoride.....	10
Early Childhood Caries.....	10
Home Oral Health Care.....	11
Nonnutritive Sucking.....	11
<i>Three to Six Years.....</i>	<i>12</i>
Dental Disease.....	12
Examination.....	12
Behavior Management.....	12
Fluoride.....	13
Radiology.....	14
Home Oral Health Care.....	14
Nonnutritive Sucking.....	14
<i>Six to 12 Years.....</i>	<i>15</i>
Oral Diseases.....	15
Examination.....	15
Fluoride.....	16
Home Oral Health Care.....	16
Sealants.....	16
Mouth Guards.....	17
Tobacco.....	18
<i>Adolescence.....</i>	<i>18</i>
Growth and Development.....	18
Oral Diseases.....	18
Examination.....	18
Home Oral Health Care.....	18

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PEDIATRIC DENTISTRY IS AN AGE-DEFINED SPECIALTY that provides both primary and comprehensive preventive and therapeutic oral health care for infants and children through adolescence, including those with special health care needs.”¹ Today, pediatric dentistry is prevention oriented. Many changes have evolved since the years when dental care for children was predominately secondary and tertiary care. The dental hygienist is a valuable resource in promoting, establishing, and maintaining oral health in infants, children, and adolescents.

This brief overview of pediatric dentistry is in two parts. The first part contains information about pertinent topics in pediatric dentistry that are not necessarily age specific. The second part concerning pediatric patients is divided into age groups. This segmenting allows for the dissemination of oral health care issues that occur at various developmental stages. This supplement touches upon a vast amount of information that is available in the field of pediatric dentistry. For more in-depth information, refer to the list of additional readings at the end of this supplement.

General Information in Pediatric Dentistry

Fluoride

Fluoride is regarded as one of the main contributing factors in the reduction of dental caries. In 1990, the National Institute of Dental and Craniofacial Research estimated the savings to Americans in reduced need for restorations at \$3 billion per year, which was largely attributed to fluorides.² Research suggests that fluoride's primary anticariogenic action is its role in the remineralization of demineralized enamel.³ To understand how fluoride intervenes in the reduction of dental caries, knowledge of tooth structure and development is necessary.

Enamel is composed of apatite-like crystals arranged in rod-like structures. Fluoride can be incorporated into the enamel surface before and after a tooth erupts. Before eruption, a fluid-filled sac bathes the developing tooth. Fluoride received systemically, by ingestion, becomes a component of this fluid and enters the maturing enamel. Post-eruptively, fluoride continues to enter the enamel surface, causing a new fluoride-enhanced apatite crystal that is less soluble than the original apatite crystal. The fluoride-rich tooth becomes more resistant to plaque-acid attacks.

Another role that fluoride plays in the prevention of dental caries is dependent on its presence in plaque. When plaque becomes acidic, fluoride ions which have become incorporated into the plaque through topical exposures are released into the plaque fluid. The fluoride and hydrogen ions combine, enter the plaque bacteria, and inhibit the metabolism of carbohydrates.

Fluoride can be classified as either systemic or topical. Systemic

forms of fluoride are meant for ingestion: fluoridated water; fluoride supplements; and foods and beverages containing fluoride. Topical fluorides include toothpaste, prophylactic pastes, gels, foams, varnishes, and mouthrinses. Fluoride products vary in concentration. The concentrations of common fluoride products are found in **Table I** and **Table II**.

Water fluoridation is a primary source of systemic fluoride. Over 50% of the U. S. population currently has access to drinking water containing a level of fluoride greater than 0.7 ppm (parts per million).⁴ Usually, the state department of public health has a record of each community water system's level of fluoride. However, the dental hygienist must not assume that a patient living in a fluoridated

community is consuming the community water. With the popularity of bottled water and water filtration systems, many patients are drinking from these alternative water sources. Reverse osmosis water purification systems remove 90% to 95% of the fluoride content in water. Bottled water varies in fluoride content with a majority below optimal concentration. If the fluoride content is unknown in a child's primary drinking water source, the water should be analyzed to determine the amount of fluoride present. State departments of public health or schools of dentistry are resources for information on where fluoride assays can be obtained. A child not consuming optimally fluoridated water should be assessed for a dietary fluoride supplement.

Table I. Topical Fluoride Preparations for Home Use

Type of Product	Active Ingredient	Percent Fluoride Ion	Usual Dose	Total mg Fluoride
Dentifrice	0.22% NaF	0.1% (w/w)	0.1–	0.1–
	0.76% MFP	0.15% w/v	1 gm	1 mg
Gels	0.4% SnF ₂	0.1%	1 gm	1 mg
	1.1% NaF	0.5%	1 gm	5 mg
	1.1% APF			
Daily Rinses	0.05% NaF	0.02%	10 ml	2 mg
Weekly Rinses	0.2% NaF	0.1%	10 ml	10mg

Table II. Topical Fluoride Preparations for Professional Use

Type of Product	Active Ingredient	Percent Fluoride Ion	Usual Dose	Total mg Fluoride
Foam	APF	1.23%	1 gm	12 mg
	2% NaF	0.9%	1 gm	9 mg
Gel	APF	1.23%	5 ml	60–62 mg
	2% NaF	0.9%	5 ml	45 mg
Varnish	5% NaF	2.3%	0.1–0.5 ml	2–11 mg
Prophy Paste	1.23% APF	1.23%	2 gm	25 mg
	2% NaF	0.9%	2 gm	18 mg

Table III. Fluoride Supplementation in Dosage Schedule

Age	Fluoride Level in Drinking Water (ppm)		
	<0.3 ppm	0.3–0.6 ppm	>0.6ppm
6 months–3 years	0.25 mg/day	none	none
3 years–6 years	0.50 mg/day	0.25 mg/day	none
6 years–16 years	1.00 mg/day	0.50 mg/day	none

1 ppm = 1 mg/liter

2.2 mg sodium fluoride = 1 mg fluoride

American Dental Association Council on Scientific Affairs Recommendations: April 1994.

Before a fluoride supplement is prescribed, a history of a child's fluoride sources needs to be obtained, including daycare and school water. Other issues that should be considered are the child's caries risk and the halo effect from food and beverages processed with fluoridated water. Evidence suggests a strong association between fluorosis and the inappropriate use of fluoride supplements during early childhood.⁵ Along with each patient's fluoride history, the fluoride dosage chart found in **Table III** can assist the practitioner in prescribing fluoride supplements.

If fluoride is administered in excessive amounts, it can produce fluorosis and even acute toxicity. Recent surveys conducted in the U.S. have shown that the prevalence and severity of fluorosis is increasing among school-age children.⁶ Enamel fluorosis is the discoloration of

enamel ranging in severity from small white specks to brown stain with pitting. The critical time period during which maxillary permanent incisors are at risk for fluorosis has been determined to be during a four-month time period beginning around age 22 months.⁷

Acute toxicity can result from the ingestion of excessive amounts of fluoride. The amount of fluoride needed to cause a toxic reaction is directly related to the weight of the child. The probable toxic dose is 5 mg of fluoride per kilogram of body weight.⁴ Early symptoms of fluoride poisoning include nausea, vomiting, and diarrhea, and can begin to occur at 1 mg fluoride per kilogram of body weight.⁸ All fluoride products should be stored out of reach of young children.

Public Health Dentistry

Dental decay is still a serious public health problem for U.S. children and is one of the most common diseases of childhood.⁹ More than one half of children age six to eight years, and over 66% of all 15-year-old adolescents continue to experience tooth decay. Furthermore, one-third of the decayed teeth in children age six to eight years have not been repaired.¹⁰ Children of low socioeconomic status and from minority groups experience higher caries rates and at an earlier age.⁹

Many children with caries have a difficult time obtaining access to oral health care. This is especially true for very young children and for children enrolled in Medicaid. One study found that only 26% of dentists are willing to provide exams to children age three to five years.¹¹ The U.S. Department of Health and Human Services' Office of the Inspector General reported that only 18% of Medicaid-eligible children received a single preventive oral health care service during the course of a year.¹²

To increase access to dental care, a Children's Health Insurance Program (CHIP) was established with the passage of the Balanced Budget Act of 1997. The program targets working, low-income families who do not have health insurance coverage and offers low cost or free health insurance for children through 18 years of age. This insurance plan is a state-by-state operated effort to provide health coverage for children. While dental coverage is not a mandated benefit, many states have incorporated oral health benefits into their CHIP programs.

School-based dental sealant programs are another means of reaching children who lack access to dental care. These programs usually target schools with a high percentage of low-income children. The number of students who qualify for free and reduced meals is one of the indicators of a school's neediness. Specific grades are selected to participate in sealant programs in accordance with eruption of permanent molars. When areas of tooth decay are identified during screenings for sealant placement, referrals for dental care can be coordinated through area dentists, public health agencies, or school based dental clinics. Other services that can be provided in schools are fluoride rinsing programs in areas devoid of water fluoridation, dental screenings, and oral health education. Dental hygienists are often

The critical time period during which maxillary permanent incisors are at risk for fluorosis has been determined to be during a four-month time period beginning around age 22 months.

the integral professionals in these school-based oral health care programs.

“Healthy People” is the nation’s prevention agenda for health. In 1990, Healthy People 2000 was released as a resource that identified areas of significant preventive threats to health. One of the 22 priority areas in “Healthy People 2000” was oral health. The oral health objectives contained several aims at preventing oral disease in children. The final data accumulated on the Healthy People 2000 objectives is being compiled and analyzed. January 2000 is the release date for the Healthy People 2010 objectives. Information concerning Healthy People can be accessed on the web page <<http://www.health.gov/healthypeople>>. Dental hygienists can use this as a tool for promoting oral health activities and community initiatives to improve oral health.

Restorative Materials

Restorative materials in dentistry are continuing to change as new developments in product function, application, durability, strength, and appearance emerge. This section will highlight a few of the common and/or newer materials used in pediatric dentistry.

The amalgam restoration continues to be an effective restorative material in pediatric dentistry. Dental amalgam is one of the least technique-sensitive restorative materials.¹³ Because of the negative public attention amalgams have received due to their mercury content, some parents may request that other dental materials be used. There is no clinically controlled research indicating that mercury from amalgam restorations has any toxic effects.¹⁴ However as research and development continue to enhance the properties of adhesive tooth-colored materials, the traditional silver amalgam wanes in popularity.

The resin composite binds adhesively to enamel and dentin via

the acid-etch technique. The resin composite is a strong, yet polishable restorative material. Disadvantages of resin composites include technique sensitivity, material shrinkage, and marginal leakage. Although resin composites have greater wear resistance and can better replicate the appearance of enamel, resin modified glass ionomers are more practical when wear and appearance are not as critical.¹⁵

Resin modified glass ionomer, a tooth-colored adhesive, was introduced in 1992.¹⁶ The formulation consists of about 80% glass ionomer material combined with 20% visible light polymerized resin component.¹⁷ Unlike the self-hardening glass ionomer cements, resin modified glass ionomers cure in 30 to 60 seconds by light activation. Advantages of resin modified glass ionomer material include fluoride releasing, conservative preparation, aesthetic appearance, and ease in application.¹⁵

Preventive resin restorations

preserve tooth structure since they do not require extensive removal of tooth structure. With preventive resin restorations, only caries are removed, followed by placement of a composite resin, and sealing the remaining caries-susceptible pits and fissures on the tooth. This method is an alternative to the “extension for prevention” method used when placing amalgam restorations. A retrospective study of 2,000 preventive resin restorations concluded that more than 80% of the sealant remained intact and 98% of the composite remained intact over a period ranging from one to eight years.¹⁸ Preventive resin restorations are used widely in pediatric dentistry.

Flowable composites have essentially the same chemistry as conventional composites, except they are made thinner.¹⁹ The material has the ability to flow into the smallest micro-structural defects and then become mechanically locked there. Indications for use include small and conservative restorations, repair of defective

amalgam margins and enamel defects, blocking out undercuts, and as liners, and pit and fissure sealants.

Recently, **compomers** have been introduced into the restorative dental materials arena. Compomers are light cured, fluoride releasing, high-strength materials with adhesive properties. The material combines the technology of glass ionomer cements with light cured composites.

A majority of **dental sealant** material is formed by the reaction of bisphenol A with Glycidyl methacrylate,

There is no clinically controlled research indicating that mercury from amalgam restorations has any toxic effects.

also known as BIS-GMA.²⁰ Concerns have been raised regarding the estrogenic potential of bisphenol A from sealants. Nathanson conducted extensive analysis of sealants and concluded that the levels of bisphenol A were below the level of detectability. However, other components leached from the different dental sealant materials tested. Further studies may be needed to assess the other leached components that were detected in the study.²¹ No adverse health effects have been attributed to the placement of dental sealants.²² When selecting a dental sealant material, many properties must be considered including the following:

Fluoride versus Nonfluoride

The clinical significance of the release of fluoride from dental sealants has yet to be proven.²³ The fluoride release may help remineralize adjacent tooth structure and provide a fluoride rich layer that should be more caries resistant.

Opaque versus Clear

Opaque or tinted sealants are easier to detect, which allows for monitoring of the sealant for retention. A study has shown that the error rate in identifying the presence or absence of sealants is 1.4% for opaque and 22.8% for clear.²⁴

Light-polymerized versus Autopolymerized

Light-polymerized sealants offer some advantages over autopolymerized sealants. Light-polymerized sealants set in 15 seconds and require no

Patient ingestion of fluoride varnish occurs over a relatively long period of time because of the varnish's ability to adhere to the enamel surface.

mixing. The disadvantages of light polymerized sealants are the expense and maintenance of the light curing units. Studies have concluded the retention rates of both autopolymerized and light-polymerized are comparable.²⁵

New Trends in Pediatric Dentistry

The *atraumatic restorative technique* (ART) was first introduced by the World Health Organization for the restoration of carious lesions in underdeveloped countries.²⁶ The technique uses only hand instruments, no local anesthesia, and fluoride releasing adhesive material for restorations. Caries are removed using a spoon excavator. The use of this technique for young preoperative children with caries has been proposed in the U.S. The advantages of this technique include less noise and vibration because no handpieces or suction are used, and that the

technique is less sensitive to moisture control due to the use of glass ionomer filling material. Michael Kanellis, DDS, MS, a pediatric dentist at The University of Iowa, states, “The ART technique procedure can help stabilize the caries process in young children until they are old enough to cooperate for definitive care.”

In 1994, **fluoride varnish** became available for use in the United States.²⁷ Fluoride varnish is 5% sodium fluoride in a varnish base that provides an adhesive, waterproof coating against saliva. Clinical studies have shown caries reduction as great as 75% from the use of fluoride varnishes, with most studies demonstrating caries reduction of 25%–45%.²⁸ Other noteworthy findings include that prophylaxis is not required before fluoride varnish is applied,²⁹ fluoride uptake appears to have significantly increased when applied to dry enamel surfaces compared to water and saliva coated surfaces,³⁰ and reduction of caries is achieved on both smooth and occlusal surfaces.³¹ The recommended frequency of application for fluoride varnish is typically twice a year, with some studies suggesting more frequent applications of fluoride varnish for children at moderate to high risk for caries. Documented intervals for high-risk patients include three applications in 10 days,³² and one application every three months.³³

Patient ingestion of fluoride varnish occurs over a relatively long period of time because of the varnish's ability to adhere to the enamel surface. When 0.5 ml of 5.0% fluoride varnish is used, approximately 5 mg is ingested. Ekstrand noted that plasma fluoride concentrations after treatment were far below toxic levels.³⁴ The one disadvantage with the application of fluoride varnish is the yellowish color of the varnish that is present on the teeth while the varnish is intact.

To apply fluoride varnish for the prevention of dental caries the following steps are recommended.

1. Dispense 0.5 ml or less into a dappen dish.
2. Remove excess moisture on teeth with cotton rolls or gauze squares.
3. Apply fluoride varnish with a disposable brush or cotton tip applicator to all teeth or selected teeth. (Note: fluoride varnish adheres and sets in the presence of saliva.)
4. Instruct patient to refrain from brushing and flossing for 12 hours to allow varnish to remain in contact with tooth surfaces.

Oral Pathology

Oral pathological conditions and anomalies in children are too numerous to be covered inclusively in this supplement. However, a few of the more common pathological conditions are highlighted in **Table IV**.

Special Needs Children

Providing dental care for the child patient with special health care needs can be both challenging and rewarding. A child with special needs can have mental, physical, medical and/or social conditions that interfere with normal functioning. Treating special needs children requires a knowledge base of medical conditions and the oral health implications of the existing conditions. For instance, children with Down's syndrome have a high chance of also having a cardiac defect. Furthermore, children with Down's syndrome have a higher incidence of periodontal disease and a lower incidence of dental caries. The combination of periodontal disease and certain cardiac defects should

Table IV.

Condition	Clinical Findings	Significance	Treatment
Ankyloglossia (tongue tied)	present at birth, short lingual frenum or anterior attachment of frenum to tip of tongue	may interfere with speech and swallowing	if indicated a frenectomy
angular cheilitis	deep fissures at commissures of mouth, may bleed and ulcerate, develops superficial crust, dryness, and sometimes burning	occurs with mouth breathing and chronic licking of lips	antifungal ointment
congenital epulis	present at birth, female predilection located on anterior gingiva, localized spongy nodule, smooth surface, pink to red in color	may cause bleeding or respiratory problems	excisional biopsy, occasionally spontaneous regression
dental and palatal lamina cysts	present at birth, solitary or multiple discrete papules with smooth translucent to white surface, firm, usually 1-3 mm in size	found in 75% of newborns	no treatment necessary usually the cysts slough within 3 months
eruption cyst hematoma	localized dome-shaped, fluctuant enlargement, translucent to bluish in color, overlying an erupting tooth	tender if inflamed	no treatment necessary uncover tooth if symptomatic
hemangioma	usually detected within first year of life, female predilection, localized to diffuse, red to blue lesion, soft and compressible, blanches, most common sites are lips, tongue, and buccal mucosa	hemorrhage from trauma	surgical excision, laser ablation
mucocoele	localized, compressible fluid-filled nodule with smooth, translucent to blue surface, fluctuates in size, may be tender	most common lip swelling in children	excisional biopsy
periapical abscess	primary dentition is most frequently affected in children; nonvital, mobile tooth, tender to percussion; soft tissue swelling with purulent exudate; painful; widening of the periodontal ligament space or poor defined radiolucency	can progress to cellulitis	endodontic treatment or extraction
primary herpetic gingivostomatitis	fever, irritability, pain, lymphadenopathy, drooling, halitosis, diffuse oral and perioral vesicles and ulcers, inflamed gingiva	self-limiting infectious disease caused by herpes simplex virus, high fever and dehydration are serious complications	antipyretics, analgesics, palliative oral rinses, force fluid consumption, resolves 7-10 days
soft tissue abscess	localized or diffuse enlargement, smooth red to yellow surface, expression of purulent exudate, soft, fluctuant, tender	caused by pupal or periodontal disease or entrapment of a foreign body, may progress to cellulitis	eliminate source of infection
traumatic fibroma	localized, pedunculated or sessile nodule, pale, smooth surface, firm, found on buccal and labial mucosa, border of tongue and gingiva	most common tumor-like lesion in the oral cavity, represents hyperplastic scar tissue	excisional biopsy if indicated
traumatic ulcer	solitary lesion, variable in shape with irregular margins, shallow or deep, red or yellow pseudomembranous surface, painful	most common oral ulcer, may indicate child abuse	symptomatic relief removal of cause, heals within 2-3 days
verruca vulgaris	usually multiple, sessile lesions with white, rough surface and finger-like projections, asymptomatic	caused by human papilloma virus, auto-inoculation from sucking on fingers and nailbiting	excisional biopsy, may spontaneously resolve

Modified from Flaitz CM: *Pediatric Dentistry: Infancy Through Adolescence*. W.B. Saunders, Philadelphia 1999.

After identifying a suspected case of abuse or neglect, the next step is to report it to the Department of Human Services, Child Protective Service Agency.

alert the dental care professional to the prevention of infective endocarditis. It would be important to develop a plaque control program for this type of patient and monitor oral conditions on a regular basis, along with providing recommended antibiotic prophylaxis to prevent subacute bacterial endocarditis for children with a cardiac defect.

Children with developmental disabilities may require diet modifications because of their health conditions. Diets may be supplemented with high-calorie beverages, pureed foods, or frequent feedings, all

increasing the risk of acid production in the caries process.

Depending on the child's physical abilities, plaque removal may require partial to full assistance. With a severely disabled child, a mouth prop can help secure the mouth in an open position for cleansing. Toothbrushes with extra large handles, and sonic and electric toothbrushes, may help facilitate brushing.

Special needs children may be at higher risk for dental disease due to health conditions, diet and feeding patterns, access to dental care, and possible limited ability to provide oral home care. The dental hygienist can assist the special needs child and parents or caregiver in developing a preventive oral health plan.

Child Abuse and Neglect

Dental hygienists are mandatory reporters of child abuse and neglect. More than 65% of all cases of physical abuse involve injuries to the head, neck, or mouth.³⁵ Injuries that exhibit

patterned marks, human bite marks, adult hand imprints, or bilateral injuries are indicators for suspicion of abuse. If a questionable injury is observed, the parent and child should be asked how the injury occurred. Conflicting answers or uneasiness in providing an analysis of the injury may indicate that abusive behavior occurred.

Child neglect is defined as not providing adequate care, support, nutrition, or medical or surgical care for a child. After identifying suspected abuse or neglect, the next step is to report it to the Department of Human Services, Child Protective Service agency. The dental hygienist is not to pursue investigation, but is responsible for notifying the proper authorities who will then determine if child abuse or neglect occurred. If intervention does not occur, 50% of the time abuse will recur and be more severe.³⁶ If a mandatory reporter fails to report suspected child abuse or neglect, he or she may face legal penalties.

Age-Specific Information: Birth to Three Years, Three to Six Years, Six to 12 Years, and Adolescence

Birth to Three Years

Growth and Development

From birth to three years, a child experiences remarkable changes in growth and development. Cognitively, most of the intellectual achievements of the child during this period result from interactions between the child and their environment.³⁷ Language development in the form of expression starts with an average of 10 words in an 18-month-old and

burgeons to 1,000 words by three years of age.³⁸

Emotions in the infant and young child are often formulated by adults observing a child's behavior. Crying might be labeled as fear, smiling as joy. Oral health care practitioners especially have to deal with the emotion of fear. Fear of strangers is almost universal after seven to 12 months of age. Between 13 and 18 months of life, the feeling of fear peaks, and then begins to decline.³⁹

Physical abilities change from a newborn that has modest musculature

to a three-year-old who has good control of his body. Toddlers' large muscles are more developed than those that control smaller movements, such as finger and hands.⁴⁰ Therefore, toddlers still have great difficulty in fine motor skills.

Tooth development begins at seven weeks in utero. During pregnancy, many factors can influence the developing teeth: illness, medications, and metabolic deficiencies. At six to seven months of age, the first primary teeth begin to erupt. **Table V** can be used as a guide

for eruption sequence. By age three, generally all the primary teeth have erupted. Considering the vast growth changes, behavior, and oral development that occurs in the first three years of life, oral health care is important.

Examination

In the past, a child's first dental visit was recommended around three years of age. Fortunately, today the recommendation for the first dental visit is by a child's first birthday. (American Academy of Pediatric Dentistry, American Academy Pediatrics) The benefits of seeing the child by one year of age are establishing a place to receive oral health care, assessing risk factors that may result in dental disease, and stressing the importance of continuing oral health care.

The oral health care visit can be divided into three parts. First, a parent interview and risk assessment is conducted. Next, an examination is performed, followed by preventive and treatment recommendations. When interviewing parents about their child's health history, oral home care, and other related dental issues, it is important to gather information in a private, nonthreatening environment. As a result, communication and partnership begin to build among the child, parent and oral health care team. Conducting a risk assessment will help provide the oral health care team with possible factors that may negatively impact the child's oral health. Risk assessment allows health professionals to individualize intervention by focusing resources and education on identified risk factors. Risk assessment factors to address include prenatal/natal history, family caries history, diet and feeding methods, fluoride adequacy, oral habits, injury and trauma prevention, and home oral health care.

Table V.

Primary dentition	Hard tissue formation begins	Enamel complete	Eruption
Maxillary			
central incisor	4 mo in utero	1 1/2 mo	7 1/2 mo
lateral incisor	4 1/2 mo in utero	2 1/2 mo	9 mo
cuspid	5 mo in utero	9 mo	18 mo
first molar	5 mo in utero	6 mo	14 mo
second molar	6 mo in utero	11 mo	24 mo
Mandibular			
central incisor	4 1/2 mo in utero	2 1/2 mo	6 mo
lateral incisor	4 1/2 mo in utero	3 mo	7 mo
cuspid	5 mo in utero	9 mo	16 mo
first molar	5 mo in utero	5 1/2 mo	12 mo
second molar	6 mo in utero	10 mo	20 mo
Permanent dentition			
Maxillary			
central incisor	3-4 mo	4-5 yr	7-8 yr
lateral incisor	10-12 mo	4-5 yr	8-9 yr
cuspid	4-5 mo	6-7 yr	11-12 yr
first bicuspid	1 1/2 yr	5-6 yr	10-11 yr
second bicuspid	2 yr	6-7 yr	10-12 yr
first molar	at birth	2 1/2-3 yr	6-7 yr
second molar	2 1/2-3 yr	7-8 yr	12-13 yr
Mandibular			
central incisor	3-4 mo	4-5 yr	6-7 yr
lateral incisor	3-4 mo	4-5 yr	7-8 yr
cuspid	4-5 mo	6-7 yr	9-10 yr
first bicuspid	1 3/4 yr	5-6 yr	10-12 yr
second bicuspid	2 1/4 yr	6-7 yr	11-12 yr
first molar	at birth	2 1/2-3 yr	6-7 yr
second molar	2 1/2-3 yr	7-8 yr	11-13 yr

Modified from Pinkham JR et al.: *Pediatric Dentistry: Infancy Through Adolescence* W.B. Saunders, Philadelphia 1999.

An oral examination of an infant or toddler is usually accomplished through the help of a parent. The knee to knee position allows for the parent to help restrain a child, and provides the dental hygienist as well as the parent with good vision of the child's oral cavity (**Figure 1**). Along with the oral examination, the head and neck region should be evaluated for size, shape, and symmetry. The dental hygienist should be alerted if signs of bruising are present during the examination.



Figure 1.

Following the examination and prophylaxis, preventive recommendations should be formalized based on the risk

assessment factors, family and health history, and results of the oral examination. Anticipatory guidance, a guide on what to expect as the child enters the next developmental stage, can be provided to the parent and family.⁴¹

For example: Matthew, 18 months old, presents for his first dental visit. During the parental interview and risk assessment the following risk factors were noted:

- child was born one month prematurely
- well water is primary drinking water source
- sippy cup is being used indiscriminately
- mom brushes once a day most of the time
- snacks between meals include apple juice and dry cereals
- six year old brother has a moderate history of caries

Oral examination findings:

- areas of hypoplasia on first primary molars
- “white spot” decalcified lesions on maxillary incisors
- plaque covering two-thirds of maxillary incisors and along gumline throughout rest of mouth

Treatment:

- prophylaxis
- fluoride varnish application

Anticipatory guidance and preventive recommendations may include:

- testing well water to determine amount of fluoride
- parent brushing the child’s teeth with pea-size amount of toothpaste both morning and nighttime.

- recommending forbidding continuous snacking, offering dentally healthful snacks
- discussing preventing dental injuries due to trauma during toddler stage
- educating parent on child’s frequent use of sippy cup with apple juice and its possible dental effects
- informing parent that second primary molars may be erupting in the next six months

Recall interval: three months due to identified risks and initial formation of caries

Fluoride

Receiving an optimal amount of systemic fluoride is important during the child’s early developmental stage. If it is determined that, after six months of age, the child is not consuming an optimal amount of fluoride in the drinking water, a fluoride supplement should be considered. The supplementation dosage schedule will help practitioners prescribe systemic fluoride in appropriate amounts. Liquid fluoride supplements are available for children who are unable to chew. To obtain both a topical and systemic effect, the liquid fluoride drops can be placed directly on a child’s teeth and then swallowed. For children who can chew, tablets should be masticated and then swished throughout the mouth before swallowing.

Young children who present with structural defects in their teeth, decalcified teeth, or have experienced dental caries should be considered for a professionally applied fluoride treatment. Fluoride varnish is ideal for preoperative patients because of its ease of application, and may be placed on selected tooth surfaces.

In regard to fluoridated toothpaste, inadvertent ingestion is a concern for a child up to three years of age. An adult should monitor toothpaste use, with no more than a

pea-size amount, .25 grams of toothpaste, being used.

Early Childhood Caries

Baby bottle tooth decay (BBTD) was described 37 years ago as a caries pattern affecting all the primary upper anterior teeth, upper and lower primary first molars, and lower primary canines. The lower four anterior teeth are either unaffected or are very slightly carious. It was noted that children with this caries pattern had been put to bed with a nursing bottle of milk.⁴²

In the past decade, new theories and discoveries have led to the renaming of the disease to “early childhood caries” (ECC). The window of infectivity theory describes the acquisition of the caries-causing bacteria *Streptococcus mutans* in children to occur through the transmission of the bacteria from mother to child. The *S. mutans* being isolated from the child has the same genotype as the child’s mother, and is present in the child’s plaque at around the age of 14 months.⁴³ Other areas of investigation include that sleeping with a bottle does not cause dental decay in all children, and that the cariogenicity of milk and infant formulas remains unclear.⁴⁴

Management of early childhood caries can be accomplished through different types of intervention, depending on the progression of the disease, age of the child, and social, behavioral, and medical history of the child. Examining a child by his or her first birthday is ideal in the prevention and intervention of early childhood caries. At this initial visit, conducting a risk assessment can provide baseline data necessary to counsel the parent about preventing dental decay. In addition, if white spot decalcified areas are observed, fluoride varnish may be applied. A clinical study on applying fluoride varnish to decalcified maxillary incisors demonstrated a reduction in white spot lesions after

Young children who present with structural defects in their teeth, decalcified teeth, or have experienced dental caries should be considered for a professionally applied fluoride treatment. Fluoride varnish is ideal for preoperative patients.

six months.⁴⁵ Recall appointments should be based upon the risk assessment and examination outcomes.

In advanced stages of early childhood caries, the management of caries becomes extremely expensive and difficult to treat because such young children lack the ability to cope with extensive restorative care. General anesthesia cases are often recommended and can cost thousands of dollars.

In light of the theories and trends regarding early childhood caries, evolving management therapies are being investigated. Culturing for cariogenic flora in mothers to determine if high *S. mutans* counts are present, and then reducing the *S. mutans* counts through chlorhexidine mouthrinses is one approach. Another is educating the mother about oral transmission of *S. mutans*. For the high-risk child, inhibiting the transmission of the cariogenic bacteria by applying a bactericidal product to the child's teeth is being investigated.³⁹

Home Oral Health Care

The infant/toddler's home oral health care is the responsibility of the parent. Once teeth erupt, plaque begins to form. Because of the toddler's limited dexterity, the parent needs to perform toothbrushing. The caregiver can access a young child's mouth by having the child lie on a bed or by cradling the child's head in the caregiver's arms (**Figure 2**).

Toothbrushes with soft bristles and a small head are recommended for infants and toddlers. If toothpaste is used, only a pea size amount is needed. Flossing is not necessary until interdental contacts become present. Developing a daily routine in the child's plaque removal is crucial to the establishment of a regular toothbrushing habit. A child is more likely to object to brushing if it is an occasional activity. Suggestions for making brushing a favorable

experience are brushing to a song, counting brushing strokes, developing a hide-and-seek game with the plaque germs, and using brushing calendars.

An infant's diet is primarily milk, whether breast milk or formula. Both breast milk and formula can contribute to acid production in the caries process. However, controversy exists regarding the cariogenic potential of milk and formula. Prolonged feeding and sleeping with the bottle or nursing may in some children lead to early childhood caries. A survey conducted at a general pediatric clinic determined that 90% of the patients were bottle-feeding past 12 months of age.⁴⁶ Children should be weaned from the bottle by their first birthday.

As the infant turns to a toddler, snacking becomes a daily routine. When addressing healthful snacking in terms of oral health, emphasize to the parent eliminating continuous eating through the day and providing snacks that are healthy. Evaluate the snack food for content; fats and

proteins versus carbohydrates, consistency of the food (chewy and sticky versus a food that clears the mouth readily); consumption rate; and amount of salivary stimulation. Parents have control over their child's diet, and need to establish healthy eating behaviors at an early age.

Nonnutritive Sucking

Nonnutritive sucking is the sucking of a digit or pacifier for the purpose of comfort and is not related

When addressing healthful snacking in terms of oral health, emphasize to the parent eliminating continuous eating throughout the day and providing snacks that are healthy.



Figure 2.

to feeding and nutrition. Sucking is a natural reflex in an infant. An infant's sucking need is met by the use of his or her fingers, thumb, or pacifier. Finger sucking is seven times less likely to occur when the child is introduced to the pacifier.⁴⁷ The benefits of a pacifier include that it is easier to discontinue a pacifier habit, most pacifier habits stop between ages two to three years of age,⁴⁷ and pacifier use has been associated with a decreased risk of sudden infant death syndrome.⁴⁸

The following safety recommendations for parents with children using a pacifier should be provided: select a pacifier with a wide shield to prevent the child from fitting the entire pacifier in the mouth, have ventilation holes in the pacifier guard, do not put anything sweet on the pacifier, periodically examine the pacifier for

Parents may be concerned with the difference in color between the deciduous and permanent teeth, with the permanent teeth being yellowish or darker in color. Primary teeth appear lighter because of the thinner, more translucent layer of enamel on them.

wear and tear, and do not tie the pacifier around the child's neck.

Pacifier and digit habits can create similar changes in the dentition and jaw relationship. There is some scattered evidence that pacifier use may be less harmful in its effects, but this is not supported across all studies.⁴⁹ Intervention of the sucking habit in children less than three years of age is not indicated. In many young patients, once the sucking habit ceases, malocclusion spontaneously corrects.

Oral Health Care for Children Three to Six Years

During the preschool stage, between the ages of three and six years, the child's bone and musculature growth significantly increase. Preschool children are extremely active, and have fairly good control of their bodies. Handedness is established during this time period, with 90% of children being righthanded.⁴⁰

A dramatic emotional change that begins to emerge in the child is the development of self-control.³⁹ Because fear of strangers is diminishing, the child becomes more willing to undertake new experiences.

Cognitively, the child's ability to reason is growing substantially. At the oral health care visit, the professionals will be able to make several requests of the child. In addition, a child is able to produce mental imagery and fantasy play.

By age three years, the primary dentition has completed root development. In terms of change in dentition, the next few years are passive. Around five and a half years of age, the mandibular primary incisors begin to exfoliate, and soon, the eruption of first permanent molars begins. Parents may be concerned with the difference in color between the deciduous and permanent teeth, with the permanent teeth being yellowish or darker in color. Primary teeth appear lighter because of the thinner, more translucent layer of enamel on them.

Dental Disease

Dental caries in the primary dentition remains a problem, with higher prevalence in economically disadvantaged populations. Many factors contribute to the risk of dental caries besides socioeconomic status. Predisposing factors include amount of cariogenic microflora present,

dietary patterns, dietary content, absence of optimal fluoride, and a susceptible host—the tooth. Individual tooth susceptibility is determined to a large extent by tooth anatomy and position. Primary first molars have a lower decay rate than primary second molars because of the lack of deep pits and fissures present in primary first molars. Furthermore, interproximal decay in the primary dentition occurs most frequently between the primary first and second molars because of the larger contact area.

Gingivitis occurs in 50% of the four to five year olds, and continues to increase in prevalence with age.⁵⁰ Younger children tend to be less reactive to the same amount of plaque as older children. This can be related to the differences in bacterial composition of plaque and the changes in inflammatory responses as the child develops. Other factors affecting gingival tissue are crowding of teeth making plaque removal more difficult, mouth breathing, and eruption and exfoliation of teeth. Gingivitis is reversible and can be treated by improved oral hygiene.

Examination

The oral health care appointment for the preschool age patient continues with health history review and risk assessment of the patient. As the child grows and life situations and styles change, new risks and health issues may emerge or diminish.

Most oral examinations in the preschool patient take place in an operatory unit with the child in the dental chair. A majority of the behavior management techniques are directed towards the preschool age patient.

Behavior Management

Fear, stress, emotional conditions, personality traits, parenting, and other

factors influence children's behaviors at the dental visit. Management of children's behaviors in the dental office ranges from communication management to several techniques that require informed consent such as hand-over-mouth, conscious sedation, nitrous oxide, physical restraint, and general anesthesia.³⁹ Discussing management techniques with parents and knowing the parents' expectations builds a relationship and leads to wise choices. The following behavior management techniques will focus on communication management. Communication by both the parents and oral health care professionals is a key component for establishing rapport with the patient.

The tell-show-do technique can help reduce stress caused by fear of the unknown. The technique begins with an explanation of the procedure, followed by a demonstration, and then performance of the procedure. For example:

Julie, I am going to clean your teeth with this special toothbrush that has a rubber cup and spins around on your teeth. Let me show you how it works on your fingernail. Do you feel how soft it is? When my toothbrush spins around it makes a sound. Do you hear the sound? I am going to put a little toothpaste in the cup to help make your teeth shine. Julie, can you smell the bubble gum flavor toothpaste? Now, open up, so I can clean your teeth.

Positive reinforcement promotes desired behaviors. The communication can be through the form of a facial expression or praise. For example:

John, you are opening your mouth so wide for me. You are doing an excellent job. Thank you for being a good helper.

The distraction technique diverts the patient's attention from a perceived unpleasant procedure. For instance, a child receiving an injection may be distracted by the oral health care professional jiggling the cheek or by

singing a song. The goal is to get the patient to focus on something other than the procedure.

Voice control is a method of gaining the patient's attention, establishing authority, and discouraging negative behaviors. The technique works in part by the practitioner raising and lowering his or her voice volume and directing the voice tone according to the child's behaviors.

Conveying body language is a nonverbal communication technique. The dental hygienist can strengthen positive behavior or discourage negative behavior by posture and expressions. For example, a six-year-old who is not cooperating for dental sealants, the dental hygienist might look eye to eye at the patient with a look of disapproval, while leaning close to the child.

Many pediatric patients can be managed by these communication techniques. However, every child reacts in his or her own individual way. What works for one child may not help another patient. Professionals should continually assess how the child is responding to the management technique being employed.

Fluoride

Fluoride plays a key role in the prevention of decay in preschool age children. For children whose primary drinking water is unfluoridated, an evaluation for fluoride supplementation should be considered. By age three, most children are able to use the tablet form of fluoride supplements. Although the risk for developing fluorosis has decreased, the practitioner needs to gather information about other possible sources of systemic fluoride before prescribing a supplement.

Once the child demonstrates the oral musculature control needed to expectorate, topically applied fluorides may be administered. Over-the-counter fluoride mouthrinses

used daily can facilitate the remineralization process.

Professionally applied topical fluorides are commonly available in foam, gels, and varnish. In determining if a child patient needs a high-concentration fluoride treatment, the practitioner needs to evaluate the patient's caries risk, other fluoride exposures including water, and the cost/benefit of the professional fluoride treatment.

The tray method of applying professional fluoride gels and foam should have one to four minutes of contact time with the teeth.⁵¹ For patients not demonstrating good oral control and ability to keep fluoride trays in position, the dental hygienist should consider using a fluoride varnish product.

The following precautions should always be employed when providing a professional tray method fluoride treatment: always seat the child upright, use suction during and after treatment, fill approximately one third of the tray with fluoride product, use

Every child reacts in his or her own individual way. What works for one child may not help another patient. Professionals should continually assess how the child is responding to the management technique being employed.

appropriately fitting trays, and have the patient expectorate after the procedure. If one teaspoon or 5 ml of APF gel is used in the tray method, the total amount of fluoride entering the child's mouth is 61.5 mg. An alternative vehicle for administering fluoride professionally is the foam

fluoride. Researchers concluded that only one fifth the amount of foam fluoride is required for a tray method treatment when compared to a gel fluoride.⁵²

Radiology

Children in the three to six years age range can have difficulties in cooperating with the taking of radiographs. In the primary dentition, if contacts are not present and interproximal surfaces can be examined clinically bitewing radiographs may not be needed. If radiographs are indicated, the following suggestions may assist the dental hygienist with the radiographic procedures: select a film size that will fit comfortably in the child's mouth, usually a size 0 for the preschool age child; bend the corners of the film slightly if they are impinging on the lingual mucosa; place the film vertically if the film will not fit horizontally; and have the settings and radiographic equipment positioned before placing the film. The Snap-A-Ray device by Rinn Corporation can be used to help position the film (**Figure 3**).

Home Oral Health Care

Even though the child is becoming more independent, the parent still needs to be the primary plaque remover. Using only a pea-sized amount of fluoridated toothpaste is recommended. Studies have shown that some preschoolers swallow large amounts of toothpaste that may increase the risk of fluorosis.⁵³ Together, the parent and child can take a team approach to toothbrushing.

Contacts between the teeth appear as the spaces between the teeth

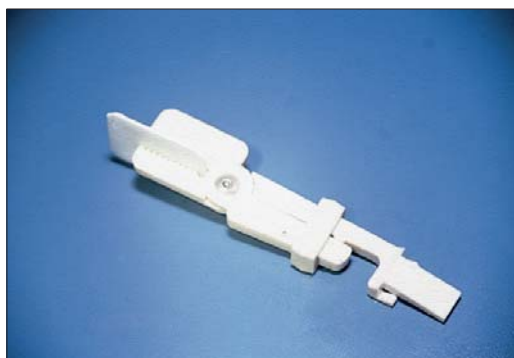


Figure 3. Snap-A-Ray.

Manufactured by Rinn Corporation

begin to close. Flossing, a fine motor skill, needs to be performed by the parent. If accessibility is a problem, floss handles can help reach posterior interproximal areas.

As the preschool child becomes more aware of food and beverage products, they want more input in their food and drink choices. Advertisements can greatly influence children's desire for certain foods. Snacking is often a favorite pastime for a preschooler. Selecting dentally healthful snacks and limiting the number of times a day snacking is allowed needs to be reinforced to parents and caregivers with children of this age group. The Food Guide Pyramid that has been adapted for young children, two to six year olds, can help provide nutritional information (**Figure 4**). This version of the Food Guide Pyramid is designed to target preschool-age children. If a child presents with moderate to high caries at the oral health care visit, the dental hygienist should conduct a diet history to evaluate the child's food and beverage intake.

Nonnutritive Sucking

During the years of three to six, most nonnutritive sucking habits have ceased. However, if a sucking habit continues past the age that coincides with the eruption of permanent maxillary incisors, intervention techniques may be indicated. The

presence and degree of malocclusion is related to several parameters: duration, frequency, and intensity of the sucking habit. Also, how the thumb, finger, or pacifier is placed in the oral cavity can affect tooth placement.

Several different approaches are available to assist in the cessation of a sucking habit. Counseling the patient is one of the most common and simple methods. One point to stress with the child is how the sucking habit has affected the child's appearance. *David Decides* by Susan Heitler, published by Reading Matters, is a story about a boy trying to quit a thumb habit. The parent could find a quiet time with the child to read and discuss the story. This method can include weekly phone calls by the dental hygienist to receive feedback and provide support.

Reminder therapy can be used for children who want to stop the habit, but need additional help. Placing an adhesive bandage around the finger, covering the hand with a mitten or sock, and painting a bitter substance on the digits being sucked are ways of reminding the child.

Another type of treatment is the reward system. A contract is agreed upon between the parent and child. When the contract is met, the child will receive a reward. Making a daily calendar for the child to record achievements increases the child's involvement in the therapy.

If the above therapies are not providing results, and more aggressive therapy is indicated; an alternative treatment is adjunctive therapy. Adjunctive therapy consists of physically interrupting the sucking habit. This may include an intraoral appliance that interferes with finger placement and ability to suck. The fabrication of the appliance will require a dental appointment.

The elastic bandage method is a nighttime therapy. Before the child goes to bed, the arm that is used for sucking should be wrapped with an elastic

bandage. The wrap should be secure, but not hinder circulation. The wrap should extend from the middle of the forearm to the middle of the upper arm. As the child relaxes, the bandage will straighten the arm and bring the fingers out of the mouth.

The success of quitting a sucking habit depends on the willingness of the child to want to quit the habit. Parents should not scold or punish a child for the habit, but rather offer encouragement.

Oral Health Care for Children 6 to 12 Years

The transitional dentition years are a period of change for children six to 12 years of age. As the deciduous teeth exfoliate, the permanent teeth begin to emerge. By the end of the 12th year, usually all the permanent teeth have erupted, except for third molars.

During the elementary school years, the child's cognitive abilities greatly expand. Communication and knowledge strengthen with each year. The capability of thinking operationally and mentally reversing actions is acquired during this time period.⁴⁰ Children in this stage of operations move freely from one point of view to another; thus they are able to be rather objective in evaluating events.³⁷ This cognitive milestone allows the child to evaluate the requests made by the oral health care practitioners, and if deemed reasonable, respond appropriately.

Between ages six and 12, children begin to accept societal norms. Temper tantrums and crying as a means of expressing dissatisfaction diminish. Being socially accepted by their peers is emotionally satisfying to school-age children.

Physically, as the child progresses through the school years, fine motor development becomes quite good. In



Figure 4. Food Guide Pyramid for young children two to six years old.

United States Department of Agriculture Center for Nutrition Policy and Promotion.

early elementary years, children are still extremely active and general fidgeting may be noticed. Also, the child may become fatigued after extended periods of activity. Towards the age of 12, girls begin to experience growth spurts and changes associated with puberty. Because girls mature earlier than boys, about two to three years, girls may be taller and larger than boys of the same age.

Oral Diseases

Even with the decline in decay that has occurred over the years in school-age children, dental caries continues to be a common problem. A 1963–1965 nationwide survey conducted by the National Center for Health Statistics found a mean decayed, missing, and filled tooth (DMFT) rate for six- to 11-year-olds to be 1.4 DMFT.⁵⁴ The National Institute of Dental and Craniofacial Research also surveyed six- to 11-year-olds in 1986–1987 and discovered a mean 0.71 DMFT, a 50% decline.⁵⁵

The prevalence of gingivitis peaks during the prepubertal and pubertal period.⁵⁰ Increased hormonal activity and poor plaque control during this period may further aggravate gingivitis.

Localized juvenile periodontitis occurs in one percent of the U.S. population.³⁹ Localized juvenile periodontitis is characterized by its unique pattern of attachment and bone loss, occurring around permanent incisors and first molars. Another closely related periodontal disease is localized prepubertal periodontitis. The attachment and bone loss occurs in the primary dentition, usually around the molar area.

Examination

Examination of the child in the transitional period focuses on bringing the child from primary dentition through mixed dentition to the permanent dentition. In interviewing the child in this age group and his or her parents at the oral health care appointment, additional risk assessment factors need to be addressed. These include sports trauma, tobacco products, the child making diet choices, and the child's ability to provide his or her own home oral health care.

The intraoral examination of the school-age child should include periodontal evaluation. Keep in mind that erupting teeth may have a deeper sulcus because of the associated inflammation. Children are less likely to brush around exfoliating and erupting teeth because of the discomfort and difficulty of brushing these areas.

Radiographic evaluation of the mixed dentition may require additional types of radiographs. Identifying missing teeth, supernumerary teeth, and developmental status of the dentition may entail a panoramic

radiograph. A variety of combinations of radiographs may be necessary to reveal tissue areas, pathology, and developmental problems. Radiographs should always be justified to keep X-ray exposure to a minimum.

Fluoride

Both topical and systemic fluoride intake is important in the prevention of dental decay in school-age children. Enamel formation continues in developing permanent teeth until around eight years of age. Fluorides applied to erupting teeth provide greater protection to these susceptible teeth. Since the child is becoming increasingly responsible for his or her oral health, sometimes home oral health care becomes poor. Plaque, inadequately removed during brushing and flossing, can act as a reservoir for fluoride. High-caries-risk children may require a daily application of a more concentrated prescription fluoride.

Home Oral Health Care

Parents need to remain a presence in their child's oral home care. Although the child is becoming the

primary remover of plaque in his or her mouth, the parent should periodically evaluate the child's oral care. Using disclosing tablets can help a child and parent assess thoroughness of plaque removal.

Around the age of eight to nine years, the child's fine motor skills usually have developed enough to begin flossing. Because flossing is a time consuming technique, the bathroom area may not be the most conducive place to floss. Recommending flossing while watching a television program could provide the time needed to floss.

Children in orthodontic treatment will need to modify brushing and flossing to clean around brackets, wires, and appliances. Around 50% of patients with banding and bonding develop demineralized white spot lesions.⁵⁶ An orthodontic patient could include a daily fluoride mouthrinse to help with remineralization of potential white spot lesions.

Healthful eating practices become more challenging as the child grows. School activities, sports, and social events may begin to disrupt regular meal times. Many families choose fast foods and convenience meals. Also, soft drink consumption becomes a matter of concern. A daily diet filled with high-calorie, high-fat, and

nutritionally empty foods may lead to obesity and nutritional deficiencies.

After school tends to be a time when the child snacks. Counseling the child and parent on healthful snack choices and avoiding continuous eating needs to be reinforced. The Food Guide Pyramid can be used as a resource in developing healthy eating practices (**Figure 5**).

Sealants

Tooth surfaces with deep pits and fissures are especially susceptible to dental caries. In the permanent dentition, a majority of caries are found on the occlusal surfaces. The discovery of the acid etch technique, etching enamel with phosphoric acid, led to the development of sealant application. When deciding to place a dental sealant, the following factors should be considered: if dental caries are present, if the tooth can be adequately isolated, if there is a history of caries, and if the pit and fissure morphology is deep or smooth. The first step in the placement of sealant is to clean the tooth surface to remove organic debris. The surface can be debrided with a prophyl cup, toothbrush, or explorer tip. Using a fluoridated paste while cleaning the surface will not reduce shear bond strengths.⁵⁷

Keeping the tooth isolated is the most challenging and most critical procedure in the success of the sealant. A simple yet effective step in achieving isolation is placing the patient's head back, with his or her chin pointing towards the ceiling. When isolating mandibular molars, using cotton roll holders and bending a triangular salivary shield to fit next to the alveolar ridge and over the dorsum of the tongue will help prevent the tongue from contaminating the tooth surface (**Figure 6**). For maxillary molars, keeping the mouth mirror to the lingual of the tooth

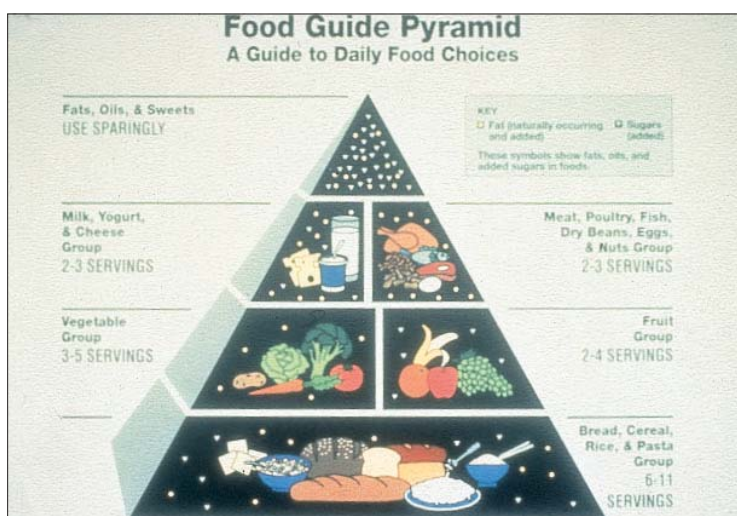


Figure 5. Food Guide Pyramid.

United States Department of Agriculture Center for Nutrition Policy and Promotion.

being sealed will not only provide indirect vision, but will help keep the tongue away from the tooth. If an operculum is present over the distal margin of the molar, isolation becomes difficult. A study demonstrated that more than 50% of the sealants failed within three years when sealants were placed on teeth that had gingival tissue extending over the distal marginal ridge.⁵⁸

The etchant material should overextend the placement of the anticipated margin of the sealant. The amount of time the etchant needs to be in contact with the tooth surfaces should be 15–20 seconds. After etching, the tooth should be rinsed long enough to remove all the etchant from the surface. If the etching was effective, the tooth surface will have a chalky white appearance when dried.

The sealant material can be placed using a preloaded dispenser, a bendable disposable brush, or a ball burnisher. If small bubbles appear in the sealant, use an instrument or brush tip to rupture the void areas to create a smooth surface.

Light polymerization of the sealant should be timed according to the product recommendations. Periodically, curing lights should be tested for intensity because, over time, performance may diminish.

After placement, the sealant should be inspected for voids, incomplete retention, distal overhangs, and/or adequate coverage. The tooth or a portion of the tooth should be resealed if one of the above is noted.

Recently, studies have suggested the use of dentin bonding agents before sealant application to improve bond strength.^{59,60} Not being able to keep the tooth isolated from salivary contamination is often cited as a reason for sealant failure. The dentin bonding agent, a hydrophilic material, is to be used on moist enamel and dentin to increase

retention of the resin. Feigal reported that a dental bonding agent before sealant application allowed successful sealant placement on enamel wet with saliva. However, both studies found no significant difference in using a primer on dry enamel. Therefore, if conditions for sealant placement are adequate, a dentin bonding agent is probably not indicated.

When applied correctly, sealants are highly effective in preventing pit and fissure decay. Studies of long-term retention of sealants have shown 41%–57% complete retention of the dental sealant after 10 years.⁶¹ Simonsen reported complete sealant retention in 27.6% and partial retention in 35.4% of permanent first molars after 15 years.⁶²

Mouth Guards

Children are participating in sports activities at early ages. Providing safety equipment for the child can prevent serious injury, such as intraoral mouth guards to protect against injuries to the teeth, jaws, and lips. Mouth guards should be recommended to all children who participate in sports activities that pose risk of injury to the mouth. Oral injury also can occur with non-contact sports such as bicycle riding, rollerblading, baseball, and volleyball. Educating children and their parents about the importance of mouth guards in the prevention of oral trauma is often overlooked. Dental hygienists need to be knowledgeable



Figure 6.

about preventing oral injury through the use of mouth guards. There are three types of mouth guards available: custom made, boil and bite, and stock.

A custom made mouth guard is fabricated from a model of the patient's mouth. After a stone model is made from the impression of the child's maxillary arch, the mouth guard material is molded to the model, giving the mouth guard proper fit and good retention when placed in the child's mouth. Surveys report that athletes prefer custom made mouth guards.⁶³ Children with braces may prefer this type of mouth guard. However, the cost of a custom-

Mouth guards should be recommended to all children who participate in sports activities that pose risk of injury to the mouth. Oral injury also can occur with non-contact sports such as bicycle riding, rollerblading, baseball, and volleyball.

made mouth guard can be around \$20–\$30 dollars or more.

A boil and bite mouth guard is often recommended for children in the transitional period. These mouth guards are available at most sport stores, drug stores, and mass merchandise department stores for usually under \$10. After boiling the preformed mouth guard, the child bites into the warm plastic causing the mouth guard to conform to the child's dentition and oral structures. Caution must be exercised when placing the warm mouth guard in the child's mouth.

Stock mouth guards are the least expensive and require no preparation. The disadvantage of this type of mouth guard is its poor fit in the mouth.

Tobacco

A risk that needs to be addressed with school-age children is tobacco use. As early as six years of age, children should be educated on the harmful effects of tobacco use. Most

Emotionally, teenagers seem to go through a period of stress, anxiety, and preoccupation. Depression is the most common type of emotional disorder during adolescence with a greater prevalence in females. Many parents comment on the difficulty in communicating with their teenage children. Peers become extremely important and influential during adolescence.

smokers and smokeless tobacco users begin the habit during childhood or adolescence. Surveys show that of adults who smoke daily, 89% of them were using cigarettes daily by age 18.⁶⁴ Furthermore, it is estimated that children and teenagers consume 26 million containers of smokeless tobacco annually.⁶⁵ A child's decision-making often focuses on short-term benefits instead of long-term risks. Evidence suggests that children who begin to use tobacco do not understand the nature of addiction, and believe they will be able to avoid the harmful effects of tobacco.⁶⁶ A child's decision to not use tobacco products can be influenced by parents, health care professionals, community leaders, and legislation. Portraying tobacco as a socially deviant behavior that has serious

health consequences needs to be stressed with young children.

Adolescence

Growth and Development

While most girls are slowing in growth and finishing puberty changes, boys are just beginning to enter puberty at around 14 years.⁴⁰ Hormonal changes bring about heightened awareness and interest in sexuality. All the developing changes can produce profound effects on the emotional, physical, and biological being of the teenager.

Emotionally, teenagers seem to go through a period of stress, anxiety, and preoccupation. Depression is the most common type of emotional disorder during adolescence with a greater prevalence in females.⁴⁰ Many parents comment on the difficulty in communicating with their teenage children. Peers become extremely important and influential during adolescence.

By the age of 13, eruption of the permanent dentition should be complete except for the third molars. The third molars usually erupt between 17 to 21 years of age, unless the third molars are congenitally missing or impacted.

Oral Diseases

The incidence of dental caries increases during adolescence. Cariogenic diet and frequent eating habits are often attributed to the intensified plaque acid attacks. Data from the 1988 to 1991 survey of caries prevalence in U.S. schoolchildren show that the mean number of decayed, missing, and filled permanent tooth surfaces increased from 0.9 DMFS for 12-year-olds to 4.4 DMFS for 17-year-olds.⁶⁷

Gingivitis peaks during puberty. Hormonal influences may exacerbate the response of the gingival tissue to

plaque and calculus deposits. The gingival papilla appear bluish red, and enlarged with granulomatous-like characteristics. The condition is reversible through proper oral hygiene.

Adult-onset periodontitis can begin in adolescence. A periodontal examination of 14–17-year-olds revealed that 20% of the teenagers had evidence of attachment loss.⁶⁸ Adult-onset periodontitis can be controlled through early diagnosis and improvements in oral hygiene.

Examination

The oral health care examination should begin with a general overall appraisal, health history review, and risk assessment interview. New risks may need to be addressed during teenage years such as tobacco, self-responsibility for oral hygiene, carbonated beverage consumption, and eating disorders.

Periodontal evaluation continues to be an important part of the oral health care visit. Probing depths, radiographic bone levels, attached gingival levels, erythema, edema, and presence of bleeding upon probing are components of the periodontal evaluation.

The prophylaxis of a teenager may call for an increased amount of scaling, as calculus formation tends to accumulate in larger amounts as a child matures. However, calculus formation is not limited to young adults; all children need to be evaluated for calculus formation, and calculus when present, needs to be removed.

Home Oral Health Care

Brushing and flossing become the responsibility of the adolescent. Because attractiveness and cleanliness are important to most teenagers, the dental hygienist should provide explanations about the patient's oral

conditions along with oral hygiene care information and skills.

With gained independence, adolescents decide on many of their food choices. Skipping meals and frequent snacking are common in this age group. Carbonated beverages are a popular drink of choice. The 12–19-year-old who consumes soft drinks will drink one to two cans each day.⁶⁹ Adolescents also are at increased risk for obesity. About one-fourth of 12–17-year-olds are at risk for being overweight, and 11% are overweight.⁷⁰ Signs of eating disorders, such as low weight, erosion of the teeth, and breath malodor, may be noticed. During adolescence, 5%–10% of females report symptoms of anorexia nervosa or bulimia.⁷⁰

Topical fluorides are important preventive agents in the erupted permanent dentition. A daily over-the-counter fluoride rinse may be a good preventive aid for the teenager with a soft drink habit. At-home prescription fluoride gels may be indicated for adolescents who exhibit high levels of caries.

Conclusion

The dental hygienist can play an important role in the oral health care of children. From birth to adolescence, the oral prevention needs of the child are ever changing. Many factors can influence the child's oral health throughout different developmental stages, whether they be parenting, socioeconomic status, health conditions, social and emotional aspects, environment, and professional care. Oral health care professionals can collaborate to provide care for all children so that the children still suffering with effects of dental disease can progress towards oral health. The definitive achievement of oral health care for children is the prevention of oral disease.

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Suggested Readings and Resources

Bright Futures in Practice: Oral Health
National Maternal and Child Health Clearinghouse
2070 Chain Bridge Road, Suite 450
Vienna, VA 22182-2536
703/821-9955 \$12.50

Scully C, Welburg R: *Color Atlas of Oral Diseases in Children and Adolescents*.
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ABC's of Infant Oral Health
American Academy of Pediatric Dentistry
211 E. Chicago Avenue, Suite 700
Chicago, IL 60611-2616
312/337-2169

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